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An unending variety of topics

Wednesday, March 29, 2017

Collecting metal: the inner and outer worlds of jewelry, coins, bullion bits, and odd shiny things

Millions of millennia ago, in our own Milky Way galaxy, but far upstream of where we are today, two neutron stars spiraled around each other, each embodying the mass of a sun but smaller and faster than a speeding planet. Each of these tiny gigaworlds, millions of times denser than our sun, had been produced, not by a mere exploding star, but by a far more powerful supernova. Each supernova, burning a nuclear fire with a far greater power density than a normal star such as our sun, had besides a neutron star also produced a cavalcade of new elements. For elements lighter than iron, this nuclear fusion releases energy; but for elements heavier than iron, including copper, silver, and gold, nuclear fusion requires a net energy input as well as astronomical power densities. Our supernovae were powerful enough to create many metals, including copper and silver, from the fusion of lighter elements. But they were not powerful enough to create gold. Gold awaited the current, far more powerful and rarer event.

Our two stars, fortuitously set into collision course by two separate supernovae, approached each other and then, captured by each others' gravity, entered a death spiral. They collided in an unimaginable explosion, unleashing a power density far greater than that of a mere supernova and trillions of times greater than if a mere mountain-sized asteroid had hit the earth. The collision was so intense that it created a black hole and a burst of extremely high energy light called gamma rays. Escaping the black hole along with the gamma rays was a spray of new, heavier metals, including gold. This gold-rich cloud in part expanded and in part coalesced, participating in the subsequent formation of new solar systems, including our own. Due to this collision of rare intensity, our unusual solar system was seeded with astronomically rare heavy metals such as gold along with the more common supernova products such as copper and silver. [Source]

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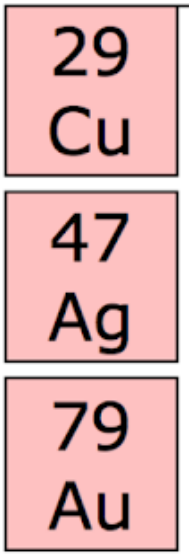

Copper (Cu), Silver (Ag), and Gold (Au) sit on top of each other on the periodic table, sharing many electrical, chemical, and material properties that enhance their durability and divisibility. Gold, the heaviest, required the most extreme conditions and energy to form, as all elements were generated, from lighter elements. Copper required easier conditions to form and is thus much more common, with silver in between.

Billions of years later, naked apes evolved with hypertrophied brains and clever hands, living on a planet in this gold-dusted solar system. They dug out the gold and silver they could find and separated it from the more common earth. Other more common metals were more useful for concretely usable tools; instead they fashioned the precious metals into what looks to our eyes like jewelry. They formed these precious metals into shapes both repetitive and unique, bragged about them, displayed them, stored them as “treasure”, “wealth”, and “money”. They fashioned gold and silver into wearable objects, transferred them to each other or stole them, even injuring or killing each other in pursuit of them. They used the gold and silver to pay each other compensation for those and many other injuries. People transferred gold and silver to each other in order to satisfy important obligations as well as to obtain items of more direct and obvious use. Since the most important such obligations happened at many of the most fitness-critical junctures of life – marriage, death, injury, war – gold and silver, as treasure and as money, came to be greatly desired.

Some metal collectibles came in a wide variety of artistically skilled forms. Others came in the form of coins: labeled, mass-produced pieces of metal stamped by the blow of a hammer or cast in molds, whereby a mostly-trusted brand named their alleged value. Still others came in forms that look odd to us, resembling neither coins nor fancy jewelry, but rather utilitarian-looking pieces that manage to make precious metals ugly, and that might have been worn but that look, long before the era of factories, like they were mass produced. . People around the world wore gold jewelry proudly, and globe-straddling monetary systems, on which economies were said to be based, were defined around gold and silver objects and debts denominated in weights of those metals.

We can think of collectibles as coming at us at two levels, like railroads and trains, or like pipelines and the oil they carry. At the most basic or “inner layer” is the metal itself that constitutes the substance of the collectible: occasionally iron, more typically copper or bronze for the less valuable collectibles, and the precious metals, especially gold and silver, for the more valuable money and treasure.

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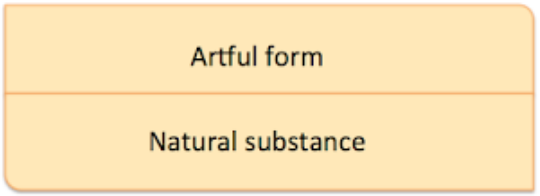
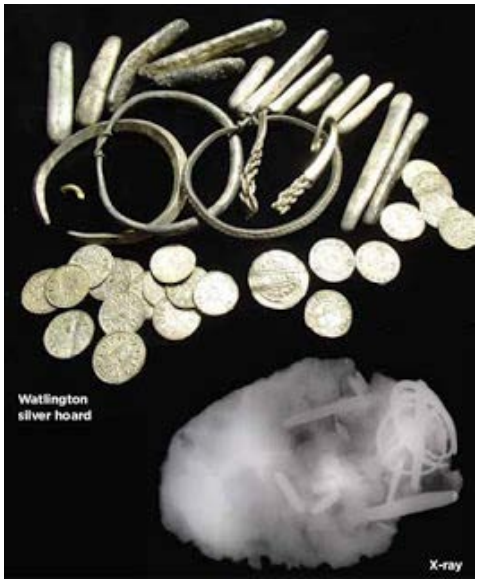


The "protocol stack", or distinct layers of cultural understanding, for objects made out of precious metals: the natural, rare, and durable substance itself, versus the particular forms given to it as artwork, jewelry, coins, etc.

So important is the "lower layer" of the traditional cultural understanding of gold and silver, the natural substance itself, evaluated by its weight rather than by any value added via the craftsmanship or its form, that Europeans of earlier generations evolved a word for it: bullion. Bullion is the metal itself, considered and valued only for its substance. Jewelry, coins, and other ways of shaping precious metals are just various forms of the underlying bullion.

The famous gold/silver ratio (exchange rate) operates at this basic level. The cost and supply of precious metals, given the technological similarity of the means for mining and processing each, are dominated by their natural origins in the stars above and the geology below.



Viking hoard unearted in Watlington, Scotland: silver coins, small ingots, and jewelry. Why were were coins ("money") so often stashed with jewelry ("ornament")? And what is up with [those] lumps? Source

Besides their different origins in neutron star collisions and supernovae respectively, once our solar system had formed, the way our earth and its moon were formed may have also been important: when another planet collided with an earlier form of the earth, and the resulting debris clouds reformed into the earth and moon as we know it, heavier metals tended to stick with the heavier body while the lighter ones (which don't include precious metals) tended to stick with the moon. Another theory holds that this collision did not matter: practically all

the mineable concentrations of gold sunk to the center anyway; the gold we mine today came from a spate of later asteroid bombardment, said asteroids also being formed in the gold-rich dust of our early solar system.

More local geology also played a role in where we have found gold and silver: equatorial Africa was formed with more gold than Europe, and Europe and Bolivia with more silver than China. As a result, the value (in terms of other kinds of goods) of gold and silver could vary significantly across the planet, as well as the exchange rate between the two precious metals. Only with modern transportation and ubiquitous markets has the gold:silver price ratio, as well as the exchange rates between precious metals and other goods, converged on ratios that hold the world over.

Spheres of transfer and local distinctions

In 1959 Paul Bohannan [1] coined the phrase "spheres of exchange" to refer to moral or legal distinctions made between different types of exchange. Often one set of collectibles was expected to be used in one kind of exchange, and another distinct set in another. Since there are several important kinds of wealth transfer besides exchange, we can generalize Bohannan's idea to the concept of spheres of transfer. In Western cultures (and many other modern cultures under their influence), for example, we make a strong distinction between money, meant for the rapid turnover of earning and spending, and heirlooms that are expected to stay in the family for generations, with feelings of guilt or shame occurring if we have to sell a family heirloom. But it's fine to use an heirloom ring for a marriage. Similarly, we make a strong distinction between stocks and bonds on the one hand and decorative wealth objects such as jewelry and artwork on the other. So strong is our taboo that if a Western archaeologist finds a wearable (as in forager days they mostly were) collectible, it is automatically and dogmatically labeled "ornamental" or "symbolic", with wealth-related uses seldom considered. (It also doesn't help that shells, often scarce and precious treasures in indigenous environments, look like cheap tourist knick-knacks to modern eyes).

The transition from shell to metal: beads fashioned from copper (dark) and from Spondylus (spiny oyster) shells (light). The shells, transported by foot (probably by many feet and many hands) hundreds of miles from the Aegean Sea, had for thousands of years been popular in the Danube river basin when the world's earliest metal artifacts were invented there. The first copper and gold artifacts were beads fashioned to substitute for the Spondylus beads in Danube jewelry. [Source]

Legal or moral sanctions discourage transfer of objects from one sphere to another. In feudal European societies it was shameful and often

even illegal to sell or mortgage land: a lord's duty was to preserve his land and devise it intact to his eldest son. In modern Western society, weddings are one sphere of transfer (where a gift of a finger-ring is expected, as well as some household items from the guests and a feast or party thrown by the parents), whereas commerce and legal remedy in civil law is another (where payment of money is expected). Some aspects of our bodies (such as ownership of humans or payment for sex or body organs) are off limits to monetary compensation – one is expected to donate an organ, not to sell it – while many others are not (most health care, for example). All of these spheres can involve transfers of objects of substantial value, but it is disgraceful and/or illegal if they are the too obviously the wrong ones for the given sphere.

The world's oldest gold artifact – a small bead from the lower Danube river basin (4,600-4,500 BC). [Source]

In the modern West, we consider the realm of jewelry and the realm of money to be very separate spheres of transfer. It is considered either a shameful betrayal or a grim necessity if the winner of an Olympic or Nobel Prize medal or a Super Bowl ring sells it to raise money. The finger-ring is a central feature of modern weddings, but few things would offend a typical modern bride more than being paid a bride price, she or her kin being indemnified by money as if she, as we would see it, were a prostitute on long-term contract. Meanwhile, our economists obsess over money while touching on the subject of jewelry hardly at all, and certainly not as any sort of form or variant of money. We moderns can hardly imagine confusing such seemingly very different things, and indeed the very idea offends our sensibilities. But in many non-Western and earlier Western cultures this was far from the case. For them the fundamental protocol layer, the substance itself, is cherished for its own sake, and forms the great majority of the value of the item, while its protocol layer two, the "outer layer", the particular form it has been fashioned into, while often of considerable interest, is usually quite secondary in determining its value for purposes of the display and transfer of wealth.

Recycling of gold jewelry in the United States: usually to be recast as bullion bars for central bank and gold exchange-traded-fund (ETF) reserves, or for export to Asia for making jewelry for which the gold content is far more important than in the West. Occasionally cast into gold coins for "gold bugs" and collectors.

This modern Western restriction involves the more culturally local aspect of gold and silver, namely the particular form it takes (jewelry vs. coin), even though these objects are made out of the same underlying substance, and traditionally were mainly prized for the content by weight of that substance. Even in our own culture we have businesses that serve to transfer gold and silver from one sphere to another. Nevertheless, economists and other academicians often act as if money and jewelry are scientifically and objectively very distinct objects, when in fact this is a cultural convention that is largely confined to the modern West.

Globe-trotting gold dealer Roy Sebag has [described] the differences between Asian and Western views of jewelry. As he describes it, over $2 trillion worth of jewelry is owned by about 2 billion people in India and China alone, constituting a much larger fraction of their wealth on average than in the West. The metal content of the gold jewelry constitutes the vast majority of its sales price and its assessed value as collateral, as it also does in Brazil, Russia, and most other countries outside of Western Europe, the British Commonwealth, and the United States. In the latter countries, precious metal content constitutes only a small fraction of the sales price or pawning value of jewelry. "Jewelry is money" is how Sebag summarizes his observations of the modern Asian jewelry market.

In cultures without a strong distinction between decorative jewelry and money, they often didn't even bother melting it down to switch from coins to lower velocity but more displayable forms of wealth. Roman gold coin minted c. 400 AD, converted in the 7th century into an Anglo- Saxon pendant. [Source] [See also]

While the “lower" or "inner" layer of the metal collectible “protocol stack” is its natural substance, its “upper" or "outer" layer is the particular form it takes. Sometimes it is mass produced (as in coins and common bead shapes) and sometimes it is a unique work of exquisite and rare craftsmanship. Form and style is the “protocol layer” of gold artifact most highly valued and distinguished in modern Western jewelry; but it is far less valued, compared to the natural substance itself, in the vast majority of Asian and pre-modern Western jewelry. As with [pre-metal forms of collectibles], the form of metal collectibles can be sub-divided, in a way generalizable across nearly all known cultures, into treasure (typically of high value and not as an object fungible or divisible, unless melted down destroying the particular object) and money (objects such as coins that are meant to be efficiently transferred and combined with other such objects to create the particular amount of value needed).

Metal or metaled treasure has taken the form of gilded objects, sculptures, various utilitarian objects enhanced artistically and made out of the scarcer metals, as well as jewelry. Treasure was, and sometimes still is, typically used for heirlooms, displays of wealth, as collateral for loans of money, and for large wealth transfers. In traditional societies these wealth transfers usually accompanied fitness-critical events. They often occurred at marriages, deaths, to satisfy obligations entered into to end wars, and as compensation for major injuries, as well as in helping to facilitate trade.

The Stollhoff hoard – copper spirals and axe blades as well as gold discs from the upper Danube river watershed (modern Austria), c. 4000 BC. Spiral armbands were among the earliest large items worked from native copper, in the middle Danubian basin (modern Hungary) c. 5000-4500 BC.

Money as this work defines it, on the other hand, can be distinguished from treasure by its fungibility and divisibility. In our Western tradition metal money and coins are practically synonymous, but with cross-cultural observations, as for example in [2] and [3], and even in modern Asia as Sebag has observed, the distinction between money and jewelry is far less clear-cut – with the proviso that in his mind, as well as in the minds of the jewelry customers and suppliers he observed, it is the divisibility and fungibility of the substance itself, not its form, that is paramount. Nevertheless, a significant fraction of the forms jewelry comes in, such as beads and constant-width wires, could be treated by their users if they so desired as fungible and divisible without destruction of even the form of the object. Indeed, such forms in jewelry, especially in the archaeological record, are more common than would seem likely if solely artistic and never monetary considerations had been involved in their original design. As a result of bringing their cultural assumptions to bear, endless energy has been wasted by Western observers trying to distinguish non-Western “money” or “primitive money” from non-Western “jewelry”.

Boringly standard, divisible, and fungible, in its particular form the underlying metal, but boasting neither the kings and dates desired by historians nor the fine craftsmanship of unique work museums, and categorizable by the dominant academic ideologies money nor art nor ornament, so it sits packed in boxes in th Danish National Museum, like many other such mundane but im artifacts underneath museums around the world. About 2,000 sm spirals were buried in a fur-lined wooden box in Denmark betw B.C. Source]

Law and "money"

Western (roughly speaking, European-derived) law, which now dominates the world, can be very flexible when it comes to applying itself to money. When supporting money with legal institutions, it tends to take a definition far more narrow the "medium of exchange and store of value" definition beloved of economists. When discouraging undesired forms, amounts, or velocities of money, on the other hand, law sometimes takes in a far broader scope of objects than Western economists think of as money.

One of the more common modern legal definitions of "money", used for laws that facilitate and support financial interchange (such as contracts for goods, checks, collateral for loans, etc.), is that money can only be an official government currency (see for example). By definition, no substance or form of matter or pattern of information of any kind, regardless of how it functions or how it is used, can be money, if has not been authorized or adopted by a government. You cannot write a legal check in any of the United States for ounces of gold or Bitcoin, because gold and Bitcoin are not, per the Uniform Commercial Code, "money".

Such definitions, while quite necessary to understand if you hope to deal with money in the majority of modern countries with such laws, are hopelessly specific to a certain kind of culture and politics, as well as being scientifically unsound as a basis for reasoning about even just the role of money in exchange even in cultures living under such laws, much less its actual much wider role in wealth transfers and in other cultures without such laws. Thus outside of this section we will neglect such official definitions of money in this work. Instead we use the objective definition presented here. This is certainly not the only possible definition of "money"; many far wider, far narrower, and very conflicting definitions of this word have been used in the ethnographic, anthropologic, archaeological, and economic literatures, usually implicitly rather than consciously, thereby causing the reader to join the author in being hopelessly confused about the subject.

Thus when enforcing rules for modern financial institutions, modern law uses a very narrow definition of money; the many other ways of storing and transferring wealth are not allowed to benefit from these advanced institutions. But when cracking down on alleged abuses of money, law often restricts a far wider array of objects used to store and transfer wealth. A great illustration of the monetary nature of jewelry is given by the current (as of this writing) Indian demonetization law. The crackdown includes gold and focuses on its natural substance, not its mere form as coin ("money" to modern Western eyes) as opposed to jewelry (supposedly "ornament" not "money"). Under Indian law it is all subject to stringent controls alongside the notes and coins:

> ...the rules governing when tax officials could seize gold: Nothing would happen "if the holding is limited to 500 grams per married woman, 250 grams per unmarried woman and 100 grams per male." It also said that there would be no limits on jewelry "provided it is acquired... from inheritance." [Source]

When Mongol conqueror Kublai Khan issued paper currency in late medieval China, to make this poorly trusted scheme work his government confiscated gold and silver, jewelry and coin alike, gems and pearls as well as gold and silver, in a forced exchange for the paper notes. [7]

Bullion bits and odd shiny things

Divisible and fungible metal forms such as coins, small thin ingots (hack-silver), arm-rings and wire, and beads have to a greater or lesser extent, depending on the culture, been used for small or frequent payments made to people who commonly need to make small acquisitions (such as the wages of soldiers and laborers), as well as to round out a value of a large wealth transfer to a specific desired value, that otherwise mostly constitutes treasure, indivisible and of a unique value somewhat different than the value desired, via custom, law, or negotiations, for the wealth transfer.

W.B. Dickinson observed the ubiquity, both as archaeological artifacts in many far-flung parts of Eurasia and in widespread use in East Asia and Indian Ocean regions, of precious metals (bullion) in wire, coil, and arm-ring, in bullion forms that looked more utilitarian than decorative, and noted the wear on such artifacts indicating that at least some had probably passed from hand to hand with a velocity more coin-like than treasure-like. He observed that their existence extended

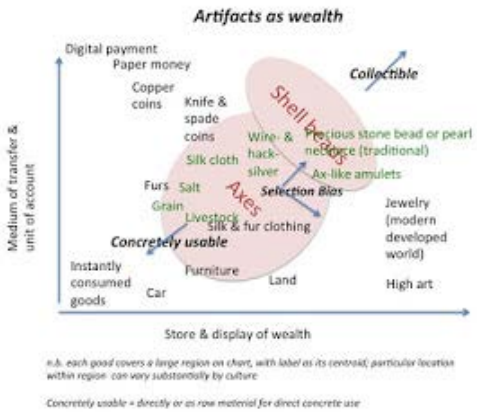
> throughout countries extending from Syria, Arabia, Egypt, Socotra, the Persian Gulf to Ceylon, China, Japan, Siam, and the whole East, to the south-west coast of Africa, to the north of Europe, to England and to Ireland. That the people of so many places, and in so various ages, should have formed their bullion and other metals into this particular form solely for the purpose of barter, without attaching to it any monetary character, seems a conclusion very difficult to arrive at...these forms were to all intents and purposes the money of the respective lands.[4]

Larger ingots, and modern central bank gold bars, and ingots of intermediate value, such as the medieval Chinese silver sycee, also called : "primary treasure". Originally "sycee" was Cantonese for "fine silk", when that costly cloth was a main form of treasure; later it was superseded as treasure by the boat-shaped silver ingots, which inherited the word "sycee", since it by then had become the generic term in Cantonese for "treasure".

Even though large ingots come in a standard form, divisible and fungible at large granularities of value, they can by our organizational scheme more properly be categorized as treasure than as money, since they were typically used like treasure in larger wealth transfers and as collateral for loans or (during the recent historical gold standard era) issues of debt-money.

Silver stamped sycee ingot [Source]

Our distinction between treasure and money, it should be apparent, is not clear-cut and is not of crucial economic or political importance. More important and much more scientifically observable is the distinction between collectibles like coins, beads, and works of laborious or uncommon craftsmanship on the one hand, and non-collectibles of concrete utility or trivial decoration on the other. I have described this distinction with many examples and much explanation in Artifacts of Wealth and Shelling Out: The Origins of Money.



The collectible continuum – more like money as we go towards the top left, more like treasure as we go towards the bottom right.

The main differences between ingots and traditional treasure were that the latter were also used as displays of wealth, whence their highly varied forms, which served to show off often high levels of craftsmanship as well as the precious metal itself. A great variety of very subtle

and clever techniques were developed for maximizing the surface area covered by a given weight of gold or silver, more bling for the buck, since the metal was the main feature of the show.

A great many cultures were observed to use non-coinage metal objects as money (by our definition), or treasure, or both, and a great many more probable such cases are implicit in the archaeological record. We can only mention a fraction of these as examples in this work.

In Viking Iceland, silver rings (by weight) were used along with cloth and cattle to pay wergeld (compensation for injuries) and bridewealth, as well as a standard of value for exchange:

> Frithof breaks his ring in pieces and distributes it to his followers, so that they shall not be impecunious in the underworld. Rings were used in marriage payments and wergeld, the latter being estimated by haugatal or ring tale. A silver ring weighing 12 ounces was the compensation for the loss of a thrall, 100 rings or 100 head of cattle for a freeman. ([2] p284)

Ring-money and hack-silver were also made and used in the rest of the pagan European north, including Scandinavia and early Anglo-Saxon England. In Celtic Ireland, “rings” in the form of divisible coils of gold or bronze were used along with cattle and slaves in injury compensation and bridewealth. ([4], [2] p287, [3] p238).

In Homeric Greece, injury compensation, slave sales, and bridewealth often included gold by weight. ([5] p27, [11], [3] p91). In Rome before the introduction of coinage, bronze or copper ingots were used, per the Twelve Tables, to pay compensation for injuries.

Non-coinage silver was also common until recent times in the vast Indian Ocean trade region as well as a number of inland cultures of south Asia. In Burma silver by weight was used for exchange and bridewealth:

> anybody wanting to transact business on the market must be provided with a lump of silver, a hammer, a chisel, weighing scales and weights.. he then quotes a price in weight. Thereupon they proceed to cut off from the lump of silver a corresponding piece which is then weighed. Often the operation has to be repeated several times until the correct weight is achieved. ([3] p95)

In Siam, gold and silver “flowers” and “leaves” were used for bridewealth and tribute. ([2] p215, 219); various weights of silver “lumps” (small ingots) were also in widespread use ([3] p93).

In the Hormuz and Lars in the Persian Gulf, and in some other parts around the Indian Ocean, were made the “fish-hook money” or silver larins used widely in the far-flung Indian Ocean trade. Such silver wires were accepted by weight across a dizzying variety of cultures. [2] p192-196

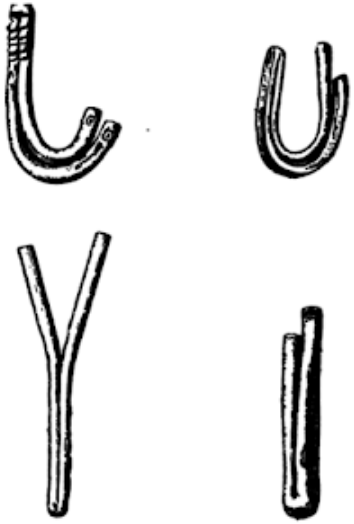


FIG. 81.—*Larins*, Persian Gulf

Larins, or silver wires bent double, and often stamped by maker; current in the very extensive Indian Ocean trade before and during the Age of Exploration. "If any suspect the goodness of the Plate it is the Custom to burn the Money in a fire red hot, and so put it in water; and if it be not then purely white it is not Currant Money." ([2] p196) Summary: technique would have worked for assaying a wide variety of wire-, coil-, or ring-like silver objects.

Bronze bells manufactured in China were used to make high-value payments in several parts of the Chinese trading periphery, such as the Philippines. ([3] p84). In the Philippine lowlands, metal luxury goods (kettles, gongs, and jars) as well as gold beads were used for a variety of wealth display and transfer purposes ([2] p265). In China bells were the first objects that were uniquely metallic; other early metal objects such as knives, beads, etc. had been made out of other materials much earlier. Thus the Chinese adopted the word and pictograph of a bell for metal (and even for gold in particular). Metal spades were styled , which, via the spades that became stylized and stamped to invent early coins, became the Chinese term for "money". [Source]

Among the early coins – defined as standardized metal objects stamped with a standard value -- were the Chinese bronze spade money, c. 475-221 BC [Source]

Copper crosses, rods, and similar shapes were popular forms of bridewealth and payment for exchange in the many cultures of the Congo ([2] p78-80). The Thonga, in what was then Portuguese East Africa, used brass rings along with mats, baskets, cattle, and beads for bridewealth, injury compensation, and fines. ([2] p104-5). The Ndebele and Nguni of Zimbabwe used brass rings and cattle for bridewealth and exchange. ([Source1], [Source2], and [2] p105)

The people of Alor, a small island north of Timor in Indonesia, used brass gongs, pigs, and (for small change / rounding out of a specific value) arrows for exchange, bridewealth, burial feasts, and "complicated financial transactions" to build large clan houses. ([3] p84-6). Brass gongs and beads were also used for bridewealth by some cultures in nearby Borneo ([8] p10). Such gongs were used for injury compensation, bridewealth, large exchanges (memorialized in ceremony), and in peace-making payments also among the hill tribes of Siam, Burma and India ([2] p204-6,) Brass pots and metal knives, axes, and hoes formed the largest part of the bridewealth of the Lakhers and Maras of the Lushai hills in India. ([8] p207).

Most peoples indigenous to the Pacific Coast of America used shell beads as treasure or money (for example the Yurok). Among the few who also used copper were the Kwakiutl, who fished for abundant salmon and lived in villages in the Pacific Northwest. They used blankets and flat copper sheets (similar in form and function to hack-silver) for bridewealth, tribute, distributions to followers (roughly similar to wages paid to soldiers and laborers), and distributions at funeral ceremonies. According to the anthropologist Frans Boas who observed them, these copper sheets served the "same function as a high-denomination bank note for us [early 20th century European-Americans]." ([2] p15, 300)

In their elaborate marketplaces, Aztecs used as payment gold dust measured out by volume from bone vials:

> The moment we arrived in this immense market, we were perfectly astonished at the vast numbers of people, the profusion of merchandise which was exposed for sale, and at the good police and order that reigned throughout...instruments of brass, copper, and tin [and] gold dust as it is dug out of the mines, which was exposed to sale in tubes made of the bones of large

> geese...The value of these tubes of gold was estimated according to their length and thickness, and were taken for exchange, for instance, for so many mantles [of] cacao nuts, slaves or other merchandise.[5]

The Aztecs also used metal money modeled on hoes (or axes) as a medium of exchange, along with cocoa beans for small change. Gold dust was also used for purchases in some parts of Siam.[3 p93].

Why did such a wide variety of cultures use, and in some cases independently invent, the use of copper and its alloys, silver, and/or gold as a store of and medium for the transfer of value? Copper, silver, and gold have the same outermost electron cloud, giving them similar electrical, chemical, and material properties, such as resistance to oxidization -- albeit due to subtleties in this cloud gold resists oxidization better than silver, which resists it better than copper. These properties enhance their durability and divisibility. Their malleability and low melting point allow them to be recycled and formed into desired shapes and makes them readily divisible. Heating the metals hot enough to glow, an ancient low-tech form of spectroscopy, allows the metals to be distinguished from fraudulent materials. (We know now that the electron cloud around each atom gives, unique for each element, off a pattern of light at unique wavelengths, seen by the eye as a unique color).

Coins

Metal stamped or cast with the brand of a highly reputable mint – often highly reputable because they were a large creditor that consistently accepted the coin in satisfaction of obligations -- had a significant, though not always decisive, advantage over other forms of metal money. Where the need for a fungible and divisible money that could change hands rapidly at low transaction costs was paramount, it came to displace other forms of metal money, and even significant amounts of treasure often ended up being recycled into coins. Coins could change hands in a reasonably secure manner with much less frequent need for weighing and assaying operations. Coins spread quickly, though not until modern times universally, from their origins in Greek and Chinese city-states. In the Middle East and Europe coins were stamped; in China they were cast.

Alongside coins grew marketplaces. As the Aztec gold dust, Persian Gulf larins, Burmese silver “lumps”, and many other examples too numerous to mention demonstrate, coins were not necessary for the existence of marketplaces, but they did help make them more efficient and widespread. The Greek conqueror Alexander the Great looted the treasuries of the Near East, converting low-velocity treasure to high-velocity coinage, making his soldiers and Near East tradesmen better-paid in the process. The subsequent Hellenistic, Roman, Persian, and Arabian empires were built on such coinage, as were medieval, Renaissance, and early industrial-era European economies. The European exploration explosion was fueled by the search for precious metals and their use to trade around the globe.

As Peter Swetz, translator of *The Treviso Arithmetic*, observes that a favorite textbook example, the alligation problem, which involved the mixing of substances in various ratios, was exemplified by the reminting of coins. “[T]he value of money [coin] was not determined by its face value, but rather its content of precious metal...throughout the sixteenth century, chapters on alligation in arithmetic books were particularly intended for German mint-masters ...[and]...Italian goldsmiths.” This was not the only use of alligation – it also could be applied to compounding medicines, the mixing of wines, and to metallurgy more generally – but it was the most valuable and compelling example of the technique. Here is one of the problems as set forth for the student:

A merchant has 46 marks 7 ounces of silver in which he knows there is 7 ¼ ounces of fine silver per mark. He wishes to reduce the purity of his silver to less than half [the example also serves to warn the apprentice merchant of such sharp practices], down to 3 ½ ounces of fine silver per mark. The question asks, “how much brass must be added to accomplish this”?

Thereafter follows multiplication and division using some Renaissance-era shortcuts suitable for this kind of problem. And *voila*, the minter’s coins have been successfully reduced in value (hopefully along with their stated face value – the textbook does not mention that aspect) and increased in number.

Touchstone and needles used by traditional European goldsmiths for assaying gold, silver, and copper, whether as coins or as jewelry. Each needle presents the visual difference made by different percentage compositions of the three metals.

Outside of this western Eurasian area, however, many non-coinage forms of money persisted and forms of debt and fiat money represented by paper were invented. When paper debt-money reaches the West, with bills of exchange to send money across hostile lands and later bank notes representing vaults hopefully full of gold, we have reached a more recent period of monetary history and our minds have ventured far beyond the origins of money. We will end here.

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Jurors examining gold coins in a recent Trial of the Pyx. This assay and audit of the British Royal Mint has been conducted periodically since the Middle Ages. Isaac Newton and many other luminaries have been involved. It is structured much like an actual court trial, with a presiding judge, a jury of laymen, and a second jury of expert goldsmiths. It also includes the most advanced assay techniques available (today including detailed spectroscopy). The purpose of this elaborate audit and ceremony is to ensure and to communicate to outsiders that the mere local cultural form is "pure", i.e. that the coins accurately label and embody the actual amount of the actually desired natural substance. The British love their traditions and the Trial of the Pyx continues to this day.

Posted by Nick Szabo at 12:25 AM

4 comments:

urgent cash offer said...

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4:12 PM

Scott Roberts said...

This comment has been removed by the author.

9:59 AM

Scott Roberts said...

The money you've described I would call "forms of money based on efficient barter that works even in anarchy".

The "treasure" category carries value (as you've described before) based on some kind of "order" produced by the objects uniqueness (including history) and/or difficulty in creating it (via skill x time). The skill could be physical and/or intellectual, including a smart understanding of the target audience's desires.

But the "government fiat money" category to me is an advancement & simplification exposing a secondary essence of money, not a setback or unavoidable cheat by powers that be. The purpose of efficient barter is to make sure the trade is honest, resulting in stronger economic individuals & stronger societies. But protocols (law) that can be employed to enforce a reduction in cheats where a fair trade is not easily determinable by the parties in the exchange. I propose most needed trades can't be easily determined to be honest. Worse, many trades can be bad for society as a whole while optimal for the parties at the exchange. So we invented government to enforce laws. But to enforce laws & keep them in "sync", it seems a single money for a single government was needed. I am reminded of economic agents in an A.I. exchanging a currency in order to buy CPU time & memory space. The use of energy in CPU time is kinetic joules & the storage of bits in memory space is the storage of potential joules. The kinetic energy in our economics is oil/gas/solar/etc. The potential energy is gold,copper,buildings roads, etc. Another form of value I'm skipping is intellectual value of the law, building designs, & programs that run iPads, etc. They do not seem to be the same kind of "treasure" mentioned above, but they both are an intellectual property.

So to make a large system optimal in at least terms of strength, a higher level of intelligence beyond anarchistic efficient barter has won human wars: large centralized governments with a single legal money. Democracy aside, it seems to have achieved this via getting all the laws "on the same page" to create a coherent body via a single money.

Cryptography & technology may make governments obsolete only in name: there will still be some kind of system-wide governing (aka a protocol) we will choose to join that optimizes trade & (more importantly) the goals of a society. The possibility of choice in our governance will advance the fittest which may make all the difference in the world. In the end, biology will be replaced by machine. The current extinction rate & expected stopping of population growth shows the trend.

As a cyclical force acting on an closed (not isolated) thermodynamic system, the moon lowers entropy. It creates order that has been crucial for life & the concentration of ores in the mantle. For example of this thermo effect, you can randomly drop balls into a jar they will not be very efficiently pack especially if they are different sizes or shapes. If you shake the jar, they pack more efficiently which lowers the entropy. It seems to be allowing mass on the surface of the Earth to congeal via our economics. Metals, silicon, & carbon fiber are created by removing oxygen from "ores" which results in a lower specific entropy per mass of the material. It joins our governed economic system for better command & control. It leads to more efficient thinking machines (CPUs control electrons where brains are stuck with molecules) & more efficient use of sunlight (solar cells are 20x more efficient than photosynthesis). Harder materials are lower entropy due to fewer possible states at a given temperature. They are more static (log-lived) & controllable. The released O2 gas increases entropy, offsetting the reduction, so Earth-wide it may not be a reduction. There is lower entropy per mass of our economic system as we switch from biology to machines.

10:36 AM

Scott Roberts said...

The point I would like to make is that you seem to be dismissing or neglecting fiat money. And yet, I believe you are the inventor of "smart contracts". Fiat money seems to be the simplified form of money that exposes the importance of contracts (which are limited and enforced by a higher-level of contracts called the governing law). A single contract unto itself is meaningless. It's importance is like the importance of having more than 1 economic agent. Contracts, like agents, must interact for a higher goal. Isn't a single currency important in such a system? For example, if the total currency represents total fluid control of the society's assets, and is printed or contracted with the economy in order to keep prices and wages stable, then a single unit (like the dollar) would represent a fixed percent control of the fluid assets. So with a stable currency to match available fluid assets under control of the assets, then the contracts can remain valid in time and space in terms of that unit. This idealized for simplicity and I'm avoiding the importance of mild inflation to prevent "loaning" hoarders ("rentiers" in classical economics) gaining interminable control of others without labor.

11:00 AM

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